REMARKS

Claims 1-17 are pending in the present Application. No claims have been canceled, Claim 1 has been amended, no claims have been added, and Claims 14-17 remain withdrawn, leaving Claims 1-13 for consideration upon entry of the present Amendment.

Amendments to Claims

Claim 1 has been amended to recite that the "number of shell polymers is at least two." Support for this amendment can be found in the Specification at least in Examples 2 and 3.

Reconsideration and allowance of the claims are respectfully requested in view of the above amendments and the following remarks.

Claim Rejections Under 35 U.S.C. § 103(a)

Claims 1-13 stand rejected under 35 U.S.C. § 103(a), as allegedly unpatentable over U.S. Patent Application Publication No. 2003/105222 ("Choi") in view of U.S. Patent No. 3,970,629 ("Izaki") and U.S. Patent No. 5,585,184 ("Baker"). Applicants respectfully traverse this rejection.

For an obviousness rejection to be proper, the Examiner must meet the burden of establishing that all elements of the invention are disclosed in the prior art; that the prior art relied upon, or knowledge generally available in the art at the time of the invention, must provide some suggestion or incentive that would have motivated the skilled artisan to modify a reference or combined references. *In re Fine*, 5 U.S.P.Q.2d 1596, 1598 (Fed. Cir. 1988). "A patent composed of several elements is not proved obvious merely by demonstrating that each of its elements was, independently, known in the prior art." *KSR Int'l Co. v. Teleflex Inc.,* 127 S.Ct. 1727, 1741 (2007). To find obviousness, the Examiner must "identify a reason that would have prompted a person of ordinary skill in the art in the relevant field to combine the elements in the way the claimed new invention does." *Id.*

Claim 1, as amended, claims:

1) the manufacture of a core with multiple shells, which is in the second step among the steps of manufacture of latexes of the present invention is done through polymerization by inputting a new monomer mixture when the conversion ratio of monomers to polymers is 55

to 95%, to prepare shell polymers, wherein the number of shell polymers is at least two. See the Specification on p. 14, line 7 to p. 15, lines 5-17;

2) After an outermost layer of the two or more multiple shell polymerizations are is completed, the chain transfer agent alone is added when the conversion ratio of an outermost layer is 60 to 95% to adjust the gel content and molecular weight of the outermost layer of the latex. See Specification, p. 14, line 7 and p. 15, lines 5-17.

However, the Examiner does not identify in the cited references Choi, Izaki, and Baker or in the art in general all the elements of timing the addition of chain transfer agent (i.e., after an outermost layer of the multiple shell polymerization step is completed) for two or more shells, which is a critical feature of the present invention.

As to the rejection over Choi in view of Izaki and Baker, the Examiner states that Choi teaches a method of making a styrene-butadiene latex for coating paper comprising preparing a styrene-butadiene core, and forming coatings around the core by emulsion polymerization. Choi, [0023], [0027]-[0029]. Choi also teaches that gel content and molecular weight of the latex is adjusted by including a chain transfer agent. Choi, [0049]. Izaki discloses that the chain transfer agent is included to reduce gel content to 60% or less, where "[t]he chain transfer agent may be used alone or in admixture and also added simultaneously or continuously. The agent may be employed as a mixture with each of the monomers. Col. 3, lines 51 to Col. 4, line 8. Applicants understand this to mean that one chain transfer agent or a mixture of such agents may be used, and that these agents are added "simultaneously", i.e., at the same time as other components (assuming a single charge or a mixture of all components) or "continuously", i.e. in a continuous, separate feed. Col. 4, lines 4-7. Izaki also discloses that the amount of chain transfer agent is "one of the most important key factors to reduce the gel content of the copolymer" and that "a larger amount of the chain transfer agent may result in a lower gel content." Col. 4, lines 4-12.

Izaki further states that "the gel content is also influenced by various other factors such as *polymerization temperature, conversion, monomer charge technique and the like*, the amount of the chain transfer agent may be decided appropriately in each case by taking the other factors into consideration. For instance, the use of about 0.6 to 0.8 part by weight or more of a chain transfer agent (e.g. dodecyl mercaptan) per 100 parts by weight of the total amount of the monomers is proper in case of the polymerization being effected at a

temperature of about 50 to 70℃ in a conversion of around 95 to 100%. Further, for instance, the use of about 0.1 to 0.2 part by weight of such chain transfer agent may be appropriate in case of the polymerization being carried out at a temperature of about -5 to 10℃ in a conversion of around 60%. When the temperature is higher, the amount of the chain transfer agent may be generally increased. When the conversion is lower, the amount of the chain transfer agent may be usually decreased." Col. 4, lines 13-42.

Izaki discloses that the chain transfer agent may be added alone, but does not teach when the chain transfer agent is added. Izaki states that "[t]*he chain transfer agent may be used alone or in admixture and also added simultaneously or continuously. The agent may be employed as a mixture with each of the monomers.*" Izaki, Col. 4, lines 4 to 8.

In the office action, it is indicated that Izaki teaches adding the chain transfer agent to the copolymer (see, e.g., Col. 3, line 51 to Col. 4, line 8). However, Izaki does not disclose the timing (i.e., at what point in the process) for adding the chain transfer agent, or that the as well as the addition to the copolymer.

Referring again to Col. 3, line 51 to Col. 4, line 8 of Izaki:

"In the production of the synthetic copolymer latex according to the present invention, there is used a chain transfer agent which not only plays the role of regulating the molecular weight of the **synthetic copolymer** but also functions to prevent the formation of a three-dimensional structure between the double bonds present in the starting monomers and remaining in the produced polymer during the polymerization. The use of such a chain transfer agent can adjust the gel content of the **synthetic copolymer**, which may provide a paper coating composition excellent in its blister-preventing and water-resistant properties during web off-set printing processes. Examples of the chain transfer agent are acrolein, methacrolein, allylalcohol, 2-ethyl-hexyl thioglycolate, mercaptans (e.g. octyl mercaptan, n-dodecyl mercaptan, t-dodecyl mercaptan, n-hexadecyl mercaptan, mixed t-mercaptans), thiuram type sulfides (e.g. tetraethylthiuram sulfide, dipentamethylene thiuram hexasulfide), ….. The chain transfer agent may be used alone or in admixture and also added simultaneously or continuously. The agent may be employed as a mixture with each of the monomers."

Baker teaches that a chain transfer agent, such as hydrogen or a metal alkyl (e.g. diethyl zinc) is normally used in polymerizations to control molecular weight. Chain transfer

agents can be employed during the prepolymerization processes and the polymerization process of this invention. Such transfer agents are well known in the art and are used in the normal manner in the polymerization of the resin product herein. Baker indicate that when a chain transfer agent is included after the prepolymerization process, it is preferably added after prepolymerization is initiated and gradually increased in concentration to produce the desired non-sticky prepolymerized catalyst. Baker, Col. 11, lines 7-17.

Further, the non-sticky prepolymerization catalyst of Baker includes particles having a shell and a core such that the prepolymer portion is substantially contained in the shell of the non-sticky prepolymerized catalyst particles, and the catalyst portion is substantially contained in the core of the non-sticky prepolymerized catalyst particle. The shell of the non-sticky prepolymerized catalyst particle should contain at least about 75 percent by weight of the prepolymer portion, and the core of the non-sticky prepolymerized catalyst particles should contain at least about 85 percent by weight of the catalyst portion of the particle. Baker, Col. 16, lines 8-18.

Baker thus only teaches that when a chain transfer agent is included after the prepolymerization process, it is preferably added after prepolymerization is initiated. However, Baker fails to suggest the proper context that after a polymerization step of an outermost layer of the multiple shell polymerization is completed, the chain transfer agent is added alone. Adding the chain transfer agent after an outermost layer of the multiple shell polymerization steps is completed is, however, acknowledged by the instant Examples.

With respect to the invention as instantly claimed, however, the results of measurement of physical properties of the coating solution and coated paper and of printing show that the latex of the *double* core-shell structure in Examples 1 and 2 shows a superior adhesive force as well as ink-drying speed and air permeability characteristics when compared to those in Comparative Example 1 having no input of a chain transfer agent after preparing double shells; and likewise, the latex of the triple core-shell structure in Examples 3 to 5, in which the gel content and molecular weight of the outermost layer is adjusted by inputting singly a chain transfer agent after the preparation of the shells, shows a more superior adhesive force as well as a very superior ink-drying speed and air permeability characteristic compared to those of the latex of the triple core-shell structure in Comparative Example 2.

The effect of adding the chain transfer agent after an *outermost layer* of the multiple shell polymerization step is completed is thus further demonstrated by the instant examples. Even where a *prima facie* case of obviousness exists, obviousness may be rebutted by a showing of "unexpected results", i.e., comparative test data showing that the claimed invention possesses unexpectedly improved properties, or properties that the prior art does not have. *In re Dillon*, 919 F.2d 688, 692-93, 16 U.S.P.Q.2d 1897, 1901 (Fed. Cir. 1990). The results must be of both statistical and practical significance. *Ex parte C*, 27 U.S.P.Q.2d 1492, 1497 (Bd. Pat. App. & Int. 1993).

In addition, Comparative Examples 3 to 6 wherein the gel content and molecular weight are adjusted during the manufacture of the shells by inputting singly a chain transfer agent after coating the second shell in the process of coating the triple shells, the ink-drying speed and air permeability improve some, but do not show significantly greatly improved physical properties compared to those of Comparative Example 2 in which no addition was made of chain transfer agent alone. In Examples 6-9 wherein the gel content and molecular weight of the outermost layer are adjusted by inputting singly a chain transfer agent after the manufacture of the last and third shell, superior adhesive force as well as ink-drying speed and air permeability are obtained.

Specifically, Comparative Examples 3 to 6 (see Specification, Table 4, p. 25), in which the gel content and molecular weight are adjusted during the manufacture of the shells by inputting singly (i.e., by only adding) a chain transfer agent *after coating the second shell* in the process of coating the triple shells, exhibit somewhat but not significantly improved ink-drying speed and air permeability physical properties relative to those of Comparative Example 2 in which there was no addition of chain transfer agent alone. However, in Examples 6 to 9 in which the gel content and molecular weight of *the outermost layer* are adjusted by adding singly a chain transfer agent after the manufacture of the last and third shell, significantly superior adhesive force as well as ink-drying speed and air permeability are obtained. Thus, the point in the process at which the chain transfer agent is added singly (after completing polymerization of multiple shells) has a significant effect on the physical properties of the resultant core-multiple shell copolymer, and hence the timing of the addition is an important factor of the invention of the instant claims. The combination of Choi, Izaki,

and Baker are silent as to this effect and provide no guidance that would lead one skilled in the art to the effect.

Hence, there is no suggestion or incentive that would lead one of ordinary skill in the art at the time the invention was made i) to add monomers and a chain transfer agent onto the core latex when the conversion ratio of monomers to polymers in the first step is at 55 to 95% to polymerize monomers on the core latex through emulsion polymerization to form two or more shell polymers; and ii) to add the chain transfer agent *alone* when the conversion ratio of an outermost layer is 60 to 95% after the outermost layer of the multiple shell polymerization step is completed.

For these reasons at least, the method of styrene-butadiene latex claimed in Claim 1 is not obvious over Choi in view of Izaki and Baker. Reconsideration and withdrawal of the rejections are respectfully requested.

Conclusion

It is believed that the foregoing amendments and remarks fully comply with the Office Action and that the claims herein should now be allowable to Applicants. Accordingly, reconsideration and allowance are requested.

If there are any additional charges with respect to this Amendment or otherwise, please charge them to Deposit Account No. 06-1130.

Respectfully submitted,

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